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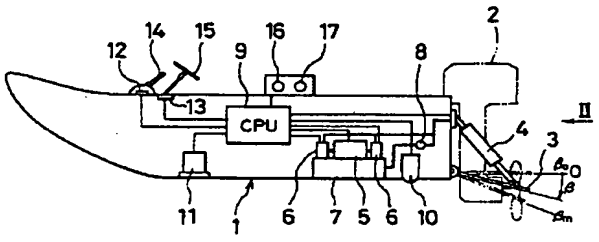
(54)【発明の名称】　船外装置の制御装置

(57)【要約】

【目的】　船体や船外機の種類の如何にかかわらず、それぞれの船舶が個々に有する特性に応じて最適の航走を保証するようにした船外装置の制御装置を提供すること。

【構成】　船外機自体２又は別に取り付けたフラップ３を傾動させるチルト装置４を設け、該チルト装置４により傾動角βを、船体の艇速νに応じて艇角θを最適にするように操作する制御部９を設けた船外装置において、前記制御部９に、１種類以上の任意の加速航走による試走に基づき、それぞれ前記艇速νと前記傾斜角βとの最適関係を設定した複数の制御パターンを作成記憶させる学習機能を具備させ、該学習機能から得られた複数の制御パターンに基づき本航走の艇角制御を行うようにした船外装置の制御装置。。



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【特許請求の範囲】

【請求項１】　船体の尾部に船外機を取り付けると共に、該船外機自体又は別に取り付けたフラップを傾動させるチルト装置を設け、該チルト装置により前記船外機自体又はフラップの傾斜角を、船体の艇速に応じて艇角を最適にするように操作する制御部を設けた船外装置において、前記制御部に、１種類以上の任意の加速航走による試走に基づき、それぞれ前記艇速と前記傾斜角との最適関係を設定した複数の制御パターンを作成して記憶させる学習機能を具備させ、該学習機能から得られた複数の制御パターンに基づき本航走の艇角制御を行う構成からなる船外装置の制御装置。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】本発明は、船外装置の制御装置に関し、さらに詳しくはそれぞれの船舶が個々に有する特性に応じて最適の艇角での航走を可能にするようにした船外装置の制御装置に関する。

【０００２】

【従来の技術】船体の尾部に船外機を取り付けて航走を行うようにした船舶では、その艇速によって船首の水面に対する浮き上がり角（艇角）が著しく変化する。しかも、艇角は船体が水面から受ける抵抗にほぼ比例し、艇速が大いに影響を受けるようになっている。一方、船体の艇角は、船体尾部に設けた船外機の傾斜角によって大きく変化し、船外機下端の推進器がアップするように傾斜角を変化させると艇角が大きくなり、ダウンするように変化させると艇角が小さくなるようになっている。

【０００３】従来、特開昭６１－１２４９８号公報や特開平２－２３７８９３号公報などに提案されるように、上記のような特性を利用することによって、船外機の傾斜角を燃料消費率を最も小さくする艇角にするように制御して、経済的な航走ができるようにした制御装置が提案されている。しかし、船体の艇角は、船底の形状，重心の位置，積荷の状況，取り付けられた船外機の種類などの要因によって様々に変化するものであるため、その制御条件は全ての船舶に対して一律に決まるものではない。したがって、上述した従来の制御装置では、あらゆる船舶に対して常に最高の効率を発揮できるとはいえず、平均的な性能しか発揮することができないのが実情であった。

【０００４】

【発明が解決しようとする課題】本発明の目的は、上述した従来の問題を解消し、船体や船外機などの種類の如何にかかわらず、それぞれの船舶が個々に有する特性に応じて最適の航走を保障できるようにした船外装置の制御装置を提供することにある。

【０００５】

【課題を解決するための手段】上記目的を達成する本発明からなる船外装置の制御装置は、船体の尾部に船外機を取り付けると共に、該船外機自体又は別に取り付けたフラップを傾動させるチルト装置を設け、該チルト装置により前記船外機自体又はフラップの傾斜角を、船体の艇速に応じて艇角を最適にするように操作する制御部を設けた船外装置において、前記制御部に、１種類以上の任意の加速航走による試走に基づき、それぞれ前記艇速と前記傾斜角との最適関係を設定した複数の制御パターンを作成して記憶させる学習機能を具備させ、該学習機能から得られた複数の制御パターンに基づき本航走の艇角制御を行う構成からなることを特徴とするものである。

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【０００６】このように本航走に先立つ学習機能によって当該船舶だけに適合する制御パターンを作成するため、船体の形状，構造或いは船外機の種類の如何にかかわらず、それぞれの船舶が個々に有する特性に応じて最適の航走を保障することができるようになる。

【０００７】

【実施例】図１及び図２は、本発明の制御装置を装備した小型船舶（ボート）の概略を示すものである。１は船体であり、その船体尾部の中央に船外機２が取り付けられ、また左右両側に一対のフラップ３，３が油圧シリンダ４，４をチルト装置として傾動可能に取り付けられている。左右の油圧シリンダ４，４は、それぞれポンプ５から電磁弁６，６を介して作動油が供給されることにより伸縮作動し、フラップ３，３を揺動させるようにしている。７は作動油を貯留した油タンク、８はリリーフ弁である。リリーフ弁８は、油圧シリンダ４が所定の圧力なったとき余剰の作動油を油タンク７へ還流させて、油圧シリンダ４の内圧が高圧にならないようする。

【０００８】９はマイクロコンピュータから構成された制御部である。制御部９には、艇速 v を検知する速度センサ１０、艇角 θ（水面に対する船体の傾斜角；図４参照）を検知する傾斜センサ１１、スロットル１４に連動してスロットル開度 γ を検知するスロットルセンサ１２、ハンドル１５に連動してハンドル角度（舵角 α）を検知する舵角センサ１３などが接続され、それぞれの検知信号が入力されるようになっている。また制御部９からは、上記ポンプ５や電磁弁６に制御信号が出力され、その制御に応じた作動油によって油圧シリンダ４を作動し、フラップ３の傾斜角 β（船体の基準線に対する傾斜角度；図４参照）を変化させるようになっている。この傾斜角 β は初期傾斜角（基準）β_0 と最大傾斜角 β_m の範囲で変化するようにしてある。

【０００９】１６はスタートスイッチ、１７は選択スイッチである。スタートスイッチ１６は、後述するデータ収集の開始，終了を制御部９に入力するもので、一度押すと制御操作がスタートし、再度押すと制御操作が終了するようにしてある。また、選択スイッチ１７は、そのオン，オフにより収集データの採用か否かを選択するようにしたものである。

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【００１０】図３は、本発明の他の実施例からなる制御装置を装備した船舶を示す。この図３の装置では、フラップ３が設けられず、船外機２自体が油圧シリンダ４によって傾動操作させられ、その傾斜角βが変化させられるようになっている。この船外機自体の傾斜角βも、初期傾斜角（基準）β_0 と最大傾斜角 β_m の範囲で変化するようになっている。

【００１１】上述のように構成された船舶は、航走中において制御部９が各センサ１０，１１，１２，１３からの検知信号に基づき、ポンプ５や油圧シリンダ４などのチルト装置を作動させることによりフラップ３または船外機２自体の傾斜角βを変化させ、艇速度νに応じて艇角θを最も効率のよい燃料消費率にするように制御する。

【００１２】本発明の制御装置による艇角θの制御は、以下に説明するように本航走前に試走することによる学習機能により作成された制御パターンにより、傾斜角βを変化させて行われるようになっている。本航走を行う前の学習機能による制御パターンの作成プロセスは、図５のフローチャートに従って実施され、（１）初期データ取込み、（２）θ－ν特性曲線を作成し、θmax とその時のνを算出、（３）ν－β線図からなる制御パターンの作成の順に行われる。

【００１３】最初の（１）初期データ取込みは、通常加速と急加速との少なくとも二通りの試走について行い、それぞれ図６（Ａ），（Ｂ）及び図７（Ａ），（Ｂ）のような時間－艇角（ｔ－θ），時間－艇速（ｔ－ν）の特性曲線を作成する。図６中に示す θ_{m1} は通常加速試走時の艇角θの最大、θ_{m2} は急加速試走時の最大であり、t_{m1}，t_{m2} はそれぞれ通常加速試走と急加速試走とにおける発進から艇角θが最大になるまでの時間である。また、図７中に示す ν_{m1}，ν_{m2} は、通常加速試走と急加速試走とにおける発進から時間 t_{m1}，t_{m2} を経過したときの艇速である。

【００１４】これらの収集データに基づいて、上記（２）のθ－ν特性曲線を図８（Ａ），（Ｂ）のように作成し、艇角θの最大とその時の艇速νを算出する。最後に、これらのデータに基づき、上記（３）の制御パターン（ν－β線図）を作成する。この制御パターンとしては、例えば図９（Ａ）の通常加速用のパターンＡ、図９（Ｂ）の中加速用のパターンＢ、（Ｃ）の急加速用のパターンＣなどのように複数の制御パターンを作成する。

【００１５】図５のフローチャートに従って、上述した通常加速試走や急加速試走を実施する場合において、ステップ５１で判断するデータ収集条件としては、①フラップが上がっているか？（船外機の場合は、初期航走位置か？）、②ギヤは前進か？（後進の場合は実施しない）、③艇速は０（km／m）か？、④スロットルは全閉か？、⑤波はないか？（外乱を避けて行うため）、⑥舵角は０か？（舵角があるときは、条件がくるいやすいため）、⑦積載条件－操船者だけか？　などが考慮される。

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【００１６】これらの条件が全てイエス（Yes ）になると、スイッチ１６を押し、ステップ５２を実行して上述した試走を行う。ステップ５３でデータ収集を終了すると、ステップ５４でその収集データの良否を判定したのち、精度の高い制御パターンを得るためにステップ５５のように最低２回のデータ収集を行うようにするのがよい。そして、上述のように複数の制御パターンを作成し、これを制御部９に記憶させて終了する。

【００１７】本航走のときの艇角制御は、上述のような学習機能によって得られた複数の制御パターンに基づいて、図１０のフローチャートのように実施され、フラップ又は船外機自体の傾斜角βが自動制御される。この制御により船舶は、その船舶が固有する特性に応じて最も効率のよい艇角となって航走を行う。図１０のフローチャートによる本航走の艇角制御は、次のようにして行われる。まず、ステップ１０１により積載条件の変化に基づく艇角θの変化が入力される。次いで、ステップ１０２によりギヤが前進のときだけ艇角制御されるようになっている。また、ステップ１０３，１０４により、舵角αが所定の常数 α_0 以上になっておらず、艇速νが制御最低速度 ν_s よりも大きいときに限って制御するようにする。ただし、艇速νが制御最低速度 ν_s よりも小さいときでも、ステップ１０５によりスロットル開度γが所定の開度 γ_m よりも大きいときは、制御が行われるようになっている。

【００１８】上述した諸条件が満足されると、ループ１０６により傾斜角βが初期傾斜角常数 β_0 よりも大きいことを確認して、フラップ又は船外機の初期位置（着水）の傾斜角βの設定が行われる。次いで、ステップ１０７によるスロットルの開速度γ'の開速度常数 γ_s ' に対する大小関係およびステップ１０８，１０９により艇角θの最大角度 θ_m に対する大小関係の判断に応じて、複数の制御パターンＡ，Ｂ，Ｃの中から適切な制御パターンが選択されて、最も効率のよい艇角制御が行われる。

【００１９】なお、上述した実施例では、学習機能で行う試走として通常加速と急加速との２種類を行ったが、この試走としては任意の１種類の加速航走であってもよく、その試走から一定の率の加算又は減算によって他の加速航走を設定して、上記２種類の場合と同様にすることができる。当然、３種類以上の加速航走によって学習機能を行うようにしてもよい。

【００２０】

【発明の効果】上述したように、本発明の制御装置によると、本航走に先立つ学習機能によって当該船舶だけに適合する制御パターンを複数作成し、この制御パターンにより本航走の制御を行うようにするため、船体の形

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状，構造或いは船外機の種類の如何にかかわらず、それぞれの船舶が個々に有する特性に応じて最も効率的な航走を保障することができるようになる。

【図面の簡単な説明】

【図１】本発明による制御装置を装備した船舶の概略図である。

【図２】図１のII矢視図である。

【図３】本発明の他の実施例からなる制御装置を装備した船舶の概略図である。

【図４】艇角θ、傾斜角β、艇速νなどを説明する説明図である。

【図５】制御パターンを作成するときのフローチャートである。

【図６】（Ａ）通常加速試走による時間ｔ－艇角θの特性曲線図である。

（Ｂ）急加速試走による時間ｔ－艇角θの特性曲線図である。

【図７】（Ａ）通常加速試走による時間ｔ－艇速νの特

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性曲線図である。

（Ｂ）急加速試走による時間ｔ－艇速νの特性曲線図である。

【図８】（Ａ）通常加速試走による艇速ν－艇角θの特性曲線図である。

（Ｂ）急加速試走による艇速ν－艇角θののの特性曲線図である。

【図９】（Ａ），（Ｂ），（Ｃ）それぞれ艇速ν－傾斜角β線図からなる制御パターンを示す図である。

【図１０】本航走時の艇角制御を行うフローチャートである。

【符号の説明】

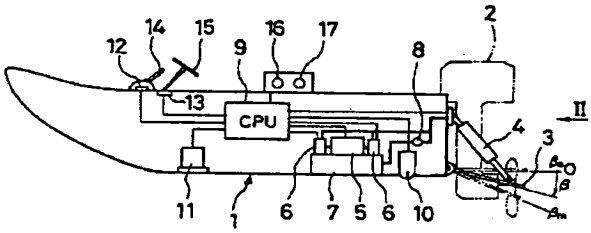
１　船体　　２　船外機　　３　フラップ

４　油圧シリンダ（チルト装置）　　５　ポンプ

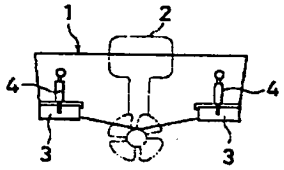
１０　速度センサ　　１１　傾斜センサ　　１２　スロットルセンサ

１３　舵角センサ

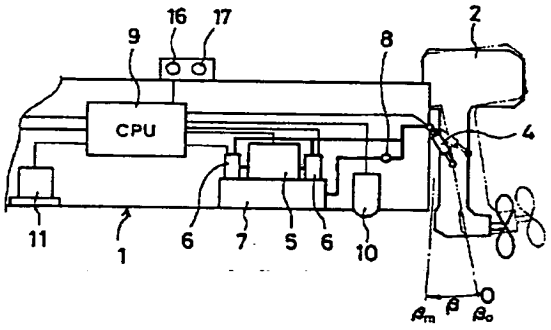
【図１】



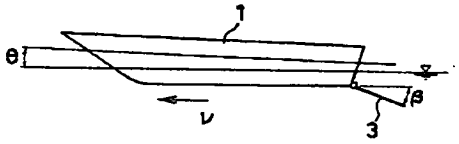
【図２】



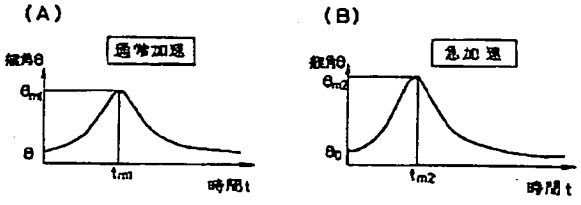
【図３】



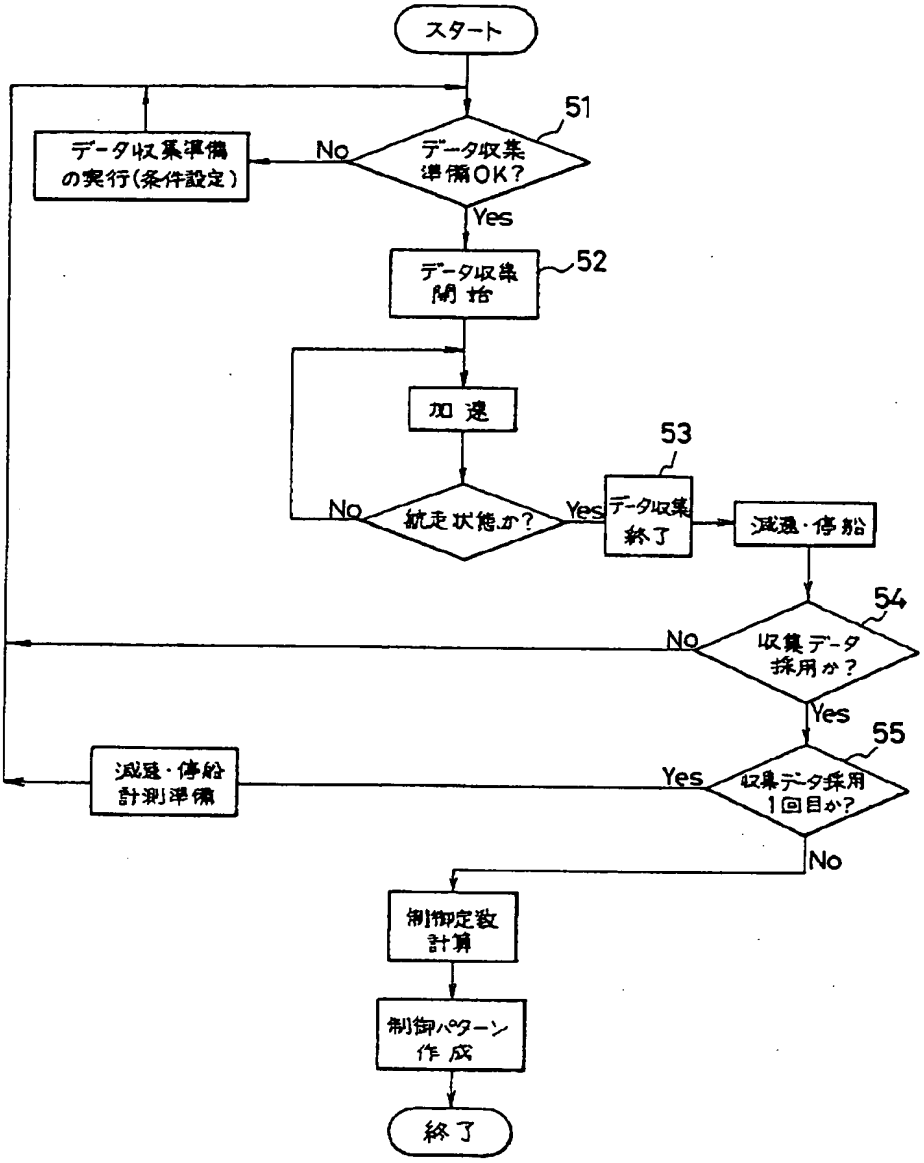
【図４】



【図６】



【図５】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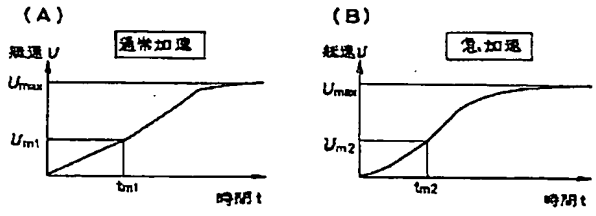
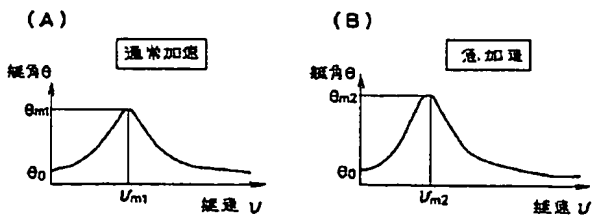
データ収集準備OK?
Yes
52
データ収集開始
加速
53
No
航走状態か?
Yes
データ収集終了
減速・停船
54
No
収集データ採用か?
Yes
55
減速・停船計測準備
Yes
収集データ採用1回目か?
No
制御定数計算
制御パターン作成
終了

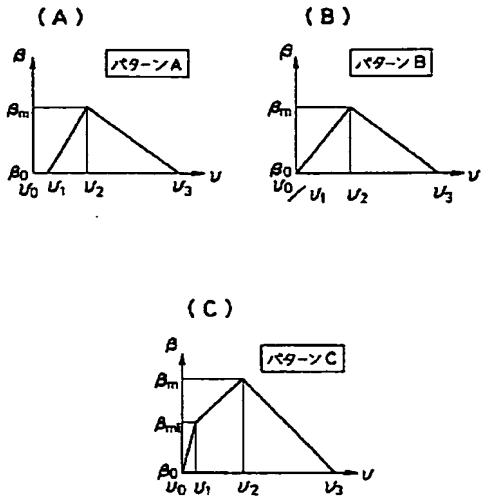
【図７】


(A)
通常加速
速度 U
Umax
Um1
tm1
時間 t
(B)
急加速
速度 U
Umax
Um2
tm2
時間 t

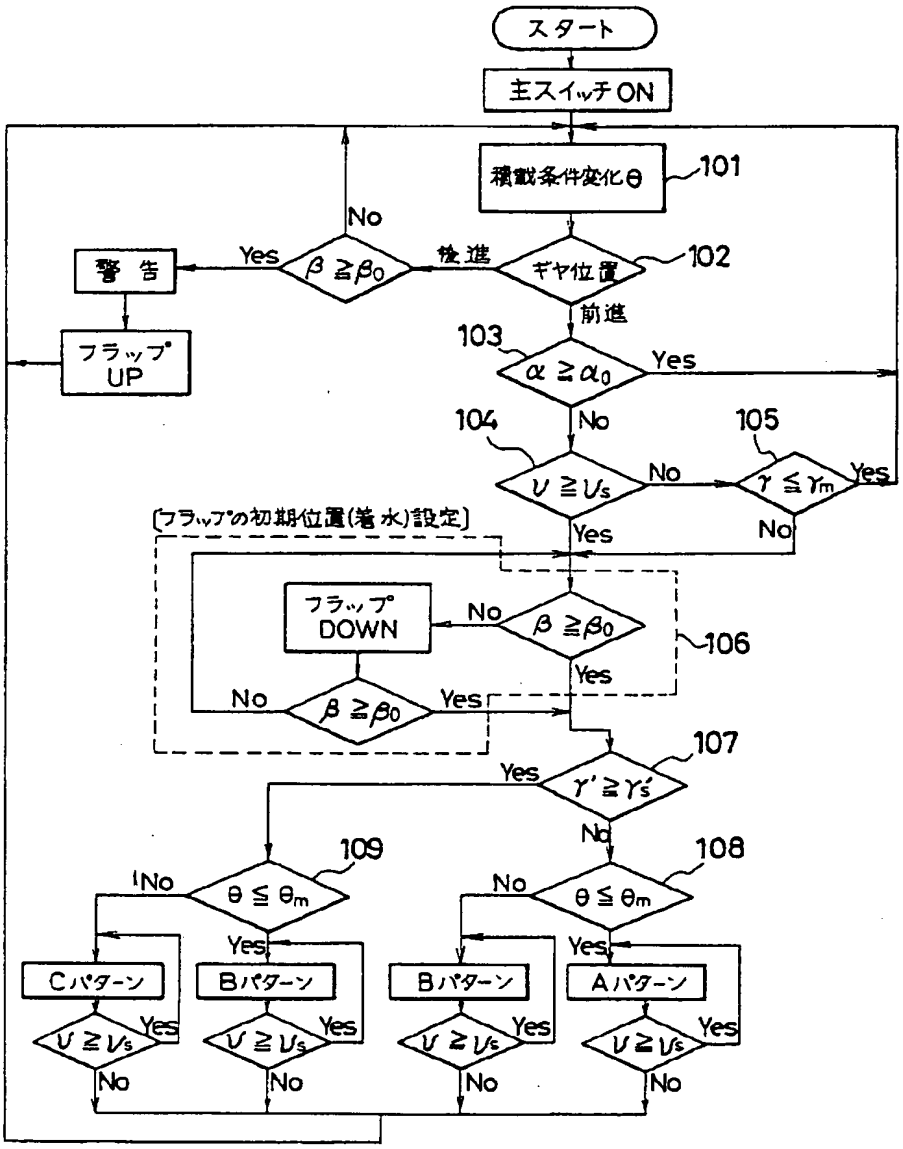
【図８】


(A)
通常加速
経角 θ
θm1
θ0
Um1
速度 U
(B)
急加速
経角 θ
θm2
θ0
Um2
速度 U

【図９】


（A）
パターンA
β
βm
β0
v0 v1 v2 v3 v
（B）
パターンB
β
βm
β0
v0 v1 v2 v3 v
（C）
パターンC
β
βm
βm
β0
v0 v1 v2 v3 v

【図１０】


スタート
主スイッチON
積載条件変化θ
101
ギヤ位置
102
後進
前進
No
Yes
β ≧ β0
警 告
フラップ UP
103
α ≧ α0
Yes
No
104
V ≧ Vs
No
105
γ ≦ γm
Yes
No
Yes
フラップの初期位置(着水)設定
フラップ DOWN
No
β ≧ β0
106
Yes
No
β ≧ β0
Yes
107
Yes
γ' ≧ γ's
No
109
No
θ ≦ θm
108
No
θ ≦ θm
Yes
Yes
Cパターン
Bパターン
Bパターン
Aパターン
V ≧ Vs
Yes
V ≧ Vs
Yes
V ≧ Vs
Yes
V ≧ Vs
Yes
No
No
No
No

PATENT ABSTRACTS OF JAPAN

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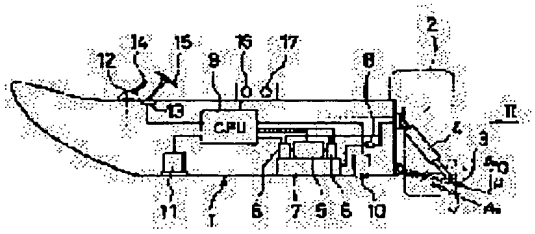
IWAMOTO TADAMITSU

(54) CONTROL UNIT FOR OUTBOARD ENGINE APPARATUS

(57)Abstract:
PURPOSE: To provide a control unit for an outboard engine apparatus which assures an optimum sailing in accordance with characteristics of respective ships independently of any type of the hull or an outboard engine.
CONSTITUTION: In an outboard engine apparatus, which comprising a tilting device 4 for tilting an outboard engine per se 2 or a flap 3 mounted independently and a controller 9 for controlling a tilting angle β by means of the tilting device 4 so as to make an angle θ of a ship optimum, the controller 9 is provided with learning functions for making and storing a plurality of control patterns wherein optimum relations between a ship speed v and the tilting angle are set on the basis of test sailing such as one or more optional accelerating sailing. Thus, there is provided a control unit for an outboard engine apparatus which controls the ship inclination for a real sailing based on a plurality of control patterns attained from the learning functions.



LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

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CLAIMS

[Claim(s)]
[Claim 1] While attaching an outboard motor in a tail of a hull, tilt equipment to which the outboard motor itself [this] or a flap attached independently is made to tilt is formed. In equipment overboard which prepared a control section which operates a tilt angle of said outboard motor itself or a flap with this tilt equipment so that **** may be made the optimal according to **** of a hull A learning function which makes two or more control patterns which set the optimal relation of said **** and said tilt angle as said control section based on **** by acceleration sailing of one or more kinds of arbitration, respectively create and memorize is made to provide. A control unit of equipment overboard which consists of a configuration of performing **** control of this sailing based on two or more control patterns obtained from this learning function.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the control unit of the equipment overboard with which each marine vessel was made to enable sailing by the optimal **** according to the property which it has separately in more detail about the control unit of equipment overboard.
[0002]
[Description of the Prior Art] By marine vessel which was made to sail by attaching an outboard motor in the tail of a hull, the relief angle (****) over the water surface of a bow changes with the **** remarkably. And **** is proportional to the resistance which a hull receives from the water surface mostly, and **** is influenced dramatically. On the other hand, it changes with the tilt angles of the outboard motor which prepared **** of a hull in the hull tail a lot, and **** will become small if it is made to change so that **** may become large and it may be downed, if a tilt angle is changed so that the propeller of an outboard motor soffit may rise.
[0003] As conventionally proposed by JP,61-12498,A, JP,2-237893,A, etc., by using the above properties, it controls to make the tilt angle of an outboard motor into **** which makes specific fuel consumption the smallest, and the control unit which could be made to perform economical sailing is proposed. However, since **** of a hull is what changes with factors, such as a configuration of a ship's bottom, a location of a center of gravity, a condition of a load, and a class of attached outboard motor, variously, the control condition is uniformly decided to no marine vessels. Therefore, in the conventional control unit mentioned above, it cannot say that the highest effectiveness can always be demonstrated to all marine vessels, but the actual condition was able to demonstrate only the average engine performance.
[0004]
[Problem(s) to be Solved by the Invention] The object of this invention solves the conventional problem mentioned above, and each marine vessel is regardless of the class of a hull, outboard motor, etc. to offer the control unit of the equipment overboard which enabled it to secure the optimal sailing according to the property which it has separately.
[0005]
[Means for Solving the Problem] A control unit of equipment overboard which consists of this invention which attains the above-mentioned object While attaching an outboard motor in a tail of a hull, tilt equipment to which the outboard motor itself [this] or a flap attached independently is made to tilt is formed. In equipment overboard which prepared a control section which operates a tilt angle of said outboard motor itself or a flap with this tilt equipment so that **** may be made the optimal according to **** of a hull A learning function which makes two or more control patterns which set the optimal relation of said **** and said tilt angle as said control section based on **** by acceleration sailing of one or more kinds of arbitration, respectively create and memorize is made to provide. It is characterized by consisting of a configuration of performing **** control of this sailing based on two or more control patterns obtained from this learning function.
[0006] Thus, since a control pattern which suits only the marine vessel concerned by learning function before this sailing is created, according to a property which each marine vessel has

separately, the optimal sailing can be secured regardless of a configuration of a hull, structure, or a class of outboard motor.
[0007]
[Example] Drawing 1 and drawing 2 show the outline of the small marine vessel (boat) equipped with the control unit of this invention. 1 is a hull, and an outboard motor 2 is attached in the center of the hull tail, and the flaps 3 and 3 of a couple use oil hydraulic cylinders 4 and 4 as tilt equipment, and it is attached in right-and-left both sides possible [tilting]. The oil hydraulic cylinders 4 and 4 on either side carry out flexible actuation, and he is trying to make flaps 3 and 3 rock by supplying hydraulic oil through solenoid valves 6 and 6 from a pump 5, respectively. The oil tank with which 7 stored hydraulic oil, and 8 are relief valves. A relief valve 8 makes excessive hydraulic oil flow back to an oil tank 7 at the time of pressure ****** predetermined in an oil hydraulic cylinder 4, and is carried out as [turn into / the internal pressure of an oil hydraulic cylinder 4 / high voltage].
[0008] 9 is the control section which consisted of microcomputers. The speed sensor 10 which detects **** nu, the dip sensor 11 which detects **** theta (the tilt angle of the hull to the water surface; refer to drawing 4), the throttle sensor 12 which is interlocked with a throttle 14 and detects the throttle opening gamma, the rudder angle sensor 13 which is interlocked with a handle 15 and detects a handle angle (rudder angle alpha) are connected to a control section 9, and each detection signal is inputted into it. Moreover, a control signal is outputted to the above-mentioned pump 5 or a solenoid valve 6, with the hydraulic oil according to the control, an oil hydraulic cylinder 4 is operated and the tilt angle beta of a flap 3 (whenever [to the datum line of a hull / tilt-angle]; refer to drawing 4) is changed from a control section 9. This tilt angle beta is the initial tilt angle (criteria) beta 0. Maximum-angle-of-inclination betam It is made to have changed in the range.
[0009] 16 is a start switch and 17 is a selecting switch. Once the start switch 16 inputs into a control section 9 initiation of the data collection mentioned later, and termination and pushes them, control operation will start it, and control operation is ended if it pushes again. Moreover, a selecting switch 17 chooses whether it is adoption of collection data by the ON and OFF.
[0010] Drawing 3 shows the marine vessel equipped with the control unit which consists of other examples of this invention. With the equipment of this drawing 3 , a flap 3 is not formed, but outboard motor 2 the very thing is made to carry out tilting actuation by the oil hydraulic cylinder 4, and that tilt angle beta is changed. The tilt angle beta of this outboard motor itself is the initial tilt angle (criteria) beta 0. Maximum-angle-of-inclination betam It changes in the range.

[0011] When a control section 9 operates tilt equipments, such as a pump 5 and an oil hydraulic cylinder 4, based on the detection signal from each sensors 10, 11, 12, and 13 during sailing, the marine vessel constituted as mentioned above changes the tilt angle beta of a flap 3 or outboard motor 2 the very thing, and is controlled to make **** theta into the most efficient specific fuel consumption according to ****** nu.
[0012] Control of **** theta by the control unit of this invention is performed by changing the tilt angle beta with the control pattern created by the learning function by ****(ing) before this sailing so that it may explain below. It carries out according to the flow chart of drawing 5 , (1) initial-data incorporation and (2) theta-nu characteristic curve are created, and the creation process of the control pattern by the learning function before performing this sailing is thetamax. It is carried out in order of creation of the control pattern which consists nu at that time of calculation and a (3) nu-beta diagram.
[0013] The first (1) initial-data incorporation usually carries out about at least two kinds of **** of acceleration and sudden acceleration, and creates the characteristic curve of time amount-**** (t-theta) respectively like drawing 6 (A), (B), and drawing 7 (A) and (B), and time amount-**** (t-nu). Usually thetam1 shown in drawing 6 is the max of **** theta of an acceleration trial travel time, thetam2 is the max of a sudden acceleration trial travel time, and tm1 and tm2 are time amount until **** theta usually becomes max from the start in acceleration **** and sudden acceleration ****, respectively. Moreover, num1 shown in drawing 7 and num2 are **** when it has usually gone through time amount tm1 and tm2 from the start in acceleration ****

and sudden acceleration ****.
[0014] Based on these collection data, the theta-nu characteristic curve of the above (2) is created as shown in drawing 8 (A) and (B), and the maximum and **** nu at the time of **** theta are computed. Finally, based on these data, the control pattern (nu-beta diagram) of the above (3) is created. As this control pattern, two or more control patterns are created, for example like the pattern A for usual acceleration of drawing 9 (A), the pattern B for acceleration in drawing 9 (B), and the pattern C for sudden acceleration of (C).
[0015] According to the flow chart of drawing 5 , as data collection conditions judged at step 51 when [which was mentioned above] usually carrying out acceleration **** and sudden acceleration **** ** Is the flap going up (in the case of an outboard motor)? Is it an initial sailing location? ** gear Advance or ? (in go-astern, it does not carry out) ** **** — 0 (km/m) — it is — ? and ** throttle — a close by-pass bulb completely — it is — aren't there ? and a ** wave (in order to carry out by avoiding disturbance)? ** rudder angle is 0 — do only ? (when there is rudder angle, conditions come — it cures — hurt) ** loading condition-navigation person [?]? **** is taken into consideration.
[0016] If all of these conditions become yes (Yes), **** which performed push and step 52 and mentioned the switch 16 above will be performed. After ending data collection at step 53 and judging the quality of the collection data at step 54, in order to obtain the high control pattern of precision, it is good to be made to perform at least two data collection like step 55. And create two or more control patterns as mentioned above, a control section 9 is made to memorize this, and it ends.
[0017] **** control at the time of this sailing is carried out like the flow chart of drawing 10 based on two or more control patterns obtained by the above learning functions, and the automatic control of the tilt angle beta of a flap or the outboard motor itself is carried out. It sails by this control by a marine vessel serving as most efficient **** according to the property in which that marine vessel carries out a proper. **** control of this sailing by the flow chart of drawing 10 is performed as follows. First, the change of **** theta based on change of loading conditions is inputted by step 101. Subsequently, **** control is carried out by step 102 only when a gear is advance. Moreover, the rudder angle alpha is the predetermined constant alpha 0 by step 103,104. It does not become above but **** nu is control minimum speed nus. It is made to control, whenever it is large. However, **** nu is control minimum speed nus. Even when small, the throttle opening gamma is predetermined opening gammam by step 105. Control is performed when large.
[0018] When the terms and conditions mentioned above are satisfied, the tilt angle beta is the initial tilt-angle constant beta 0 by the loop 106. A large thing is checked and setting out of the tilt angle beta of the initial position (splashdown) of a flap or an outboard motor is performed. subsequently — a step — 107 — depending — a throttle — open — speed — gamma — ' — open — speed — a constant — gamma — s — ' — receiving — size — relation — and — a step — 108,109 — maximum angle thetam of **** theta According to decision of size-related [receiving], a suitable control pattern is chosen out of two or more control patterns A, B, and C, and most efficient **** control is performed.
[0019] In addition, although two kinds such as acceleration and sudden acceleration were usually performed in the example mentioned above as **** performed by the learning function, as this ****, you may be one kind of acceleration sailing of arbitration, and from that ****, by addition or subtraction of a fixed rate, other acceleration sailing can be set up and can be made to be the same as that of the two above-mentioned kinds of cases. Naturally, three or more kinds of acceleration sailing may be made to perform a learning function.
[0020]
[Effect of the Invention] As mentioned above, in order according to the control unit of this invention to create two or more control patterns which suit only the marine vessel concerned and to control this sailing by the learning function before this sailing with this control pattern, according to the property which each marine vessel has separately, the most efficient sailing can be secured regardless of the configuration of a hull, structure, or the class of outboard motor.

[Translation done.]

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TECHNICAL FIELD

[Industrial Application] This invention relates to the control unit of the equipment overboard with which each marine vessel was made to enable sailing by the optimal **** according to the property which it has separately in more detail about the control unit of equipment overboard.

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PRIOR ART

[Description of the Prior Art] By marine vessel which was made to sail by attaching an outboard motor in the tail of a hull, the relief angle (****) over the water surface of a bow changes with the boat speed remarkably. And **** is proportional to the resistance which a hull receives from the water surface mostly, and boat speed is influenced dramatically. On the other hand, it changes with the tilt angles of the outboard motor which prepared **** of a hull in the hull tail a lot, and **** will become small if it is made to change so that **** may become large and it may be downed, if a tilt angle is changed so that the propeller of an outboard motor soffit may rise.
[0003] As conventionally proposed by JP,61-12498,A, JP,2-237893,A, etc., by using the above properties, it controls to make the tilt angle of an outboard motor into **** which makes specific fuel consumption the smallest, and the control unit which could be made to perform economical sailing is proposed. However, since **** of a hull is what changes with factors, such as a configuration of a ship's bottom, a location of a center of gravity, a situation of a load, and a class of attached outboard motor, variously, the control condition is uniformly decided to no marine vessels. Therefore, in the conventional control unit mentioned above, it cannot say that the highest effectiveness can always be demonstrated to all marine vessels, but the actual condition was able to demonstrate only the average engine performance.

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EFFECT OF THE INVENTION

[Effect of the Invention] As mentioned above, in order according to the control unit of this invention to create two or more control patterns which suit only the marine vessel concerned and to control this sailing by the learning function before this sailing with this control pattern, according to the property which each marine vessel has separately, the most efficient sailing can be secured regardless of the configuration of a hull, structure, or the class of outboard motor.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] The object of this invention solves the conventional problem mentioned above, and each marine vessel is regardless of the class of a hull, outboard motor, etc. to offer the control unit of the equipment overboard which enabled it to secure the optimal sailing according to the property which it has separately.

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MEANS

[Means for Solving the Problem] The control unit of the equipment overboard which consists of this invention which attains the above-mentioned object While attaching an outboard motor in the tail of a hull, the tilt equipment to which the outboard motor itself [this] or the flap attached independently is made to tilt is formed. In the equipment overboard which prepared the control section which operates the tilt angle of said outboard motor itself or a flap with this tilt equipment so that **** may be made the optimal according to the boat speed of a hull The learning function which makes two or more control patterns which set the optimal relation of said boat speed and said tilt angle as said control section based on **** by acceleration sailing of one or more kinds of arbitration, respectively create and memorize is made to provide. It is characterized by consisting of a configuration of performing **** control of this sailing based on two or more control patterns obtained from this learning function.
[0006] Thus, since the control pattern which suits only the marine vessel concerned by the learning function before this sailing is created, according to the property which each marine vessel has separately, the optimal sailing can be secured regardless of the configuration of a hull, structure, or the class of outboard motor.

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EXAMPLE

[Example] Drawing 1 and drawing 2 show the outline of the small marine vessel (boat) equipped with the control device of this invention. 1 is a hull, and an outboard motor 2 is attached in the center of the hull tail, and the flaps 3 and 3 of a couple use oil hydraulic cylinders 4 and 4 as tilt equipment, and it is attached in right-and-left both sides possible [tilting]. The oil hydraulic cylinders 4 and 4 on either side carry out flexible actuation, and he is trying to make flaps 3 and 3 rock by supplying hydraulic oil through solenoid valves 6 and 6 from a pump 5, respectively. The oil tank with which 7 stored hydraulic oil, and 8 are relief valves. A relief valve 8 makes excessive hydraulic oil flow back to an oil tank 7 at the time of pressure ****** predetermined in an oil hydraulic cylinder 4, and is carried out as [turn into / the internal pressure of an oil hydraulic cylinder 4 / high voltage].
[0008] 9 is the control section which consisted of microcomputers. The rate sensor 10 which detects boat speed nu, the dip sensor 11 which detects **** theta (the tilt angle of the hull to the water surface; refer to drawing 4), the throttle sensor 12 which is interlocked with a throttle 14 and detects the throttle opening gamma, the rudder angle sensor 13 which is interlocked with a handle 15 and detects a handle include angle (rudder angle alpha) are connected to a control section 9, and each detection signal is inputted into it. Moreover, a control signal is outputted to the above-mentioned pump 5 or a solenoid valve 6, with the hydraulic oil according to the control, an oil hydraulic cylinder 4 is operated and the tilt angle beta of a flap 3 (whenever [to the datum line of a hull / tilt-angle]; refer to drawing 4) is changed from a control section 9. This tilt angle beta is the initial tilt angle (criteria) beta 0. Maximum-angle-of-inclination betam It is made to have changed in the range.
[0009] 16 is a start switch and 17 is a selecting switch. Once the start switch 16 inputs into a control section 9 initiation of the data collection mentioned later, and termination and pushes them, control operation will start it, and control operation is ended if it pushes again. Moreover, a selecting switch 17 chooses whether it is adoption of collection data by the ON and OFF.
[0010] Drawing 3 shows the marine vessel equipped with the control unit which consists of other examples of this invention. With the equipment of this drawing 3 , a flap 3 is not formed, but outboard motor 2 the very thing is made to carry out tilting actuation by the oil hydraulic cylinder 4, and that tilt angle beta is changed. The tilt angle beta of this outboard motor itself is the initial tilt angle (criteria) beta 0. Maximum-angle-of-inclination betam It changes in the range.
[0011] When a control section 9 operates tilt equipments, such as a pump 5 and an oil hydraulic cylinder 4, based on the detection signal from each sensors 10, 11, 12, and 13 during sailing, the marine vessel constituted as mentioned above changes the tilt angle beta of a flap 3 or outboard motor 2 the very thing, and is controlled to make **** theta into the most efficient specific fuel consumption according to nu whenever [boat speed].
[0012] Control of **** theta by the control unit of this invention is performed by changing the tilt angle beta with the control pattern created by the learning function by ****(ing) before this sailing so that it may explain below. It carries out according to the flow chart of drawing 5 , (1) initial-data incorporation and (2) theta-nu characteristic curve are created, and the creation process of the control pattern by the learning function before performing this sailing is thetamax. It is carried out in order of creation of the control pattern which consists nu at that time of calculation and a (3) nu-beta diagram.
[0013] The first (1) initial-data incorporation usually carries out about at least two kinds of **** of acceleration and sudden acceleration, and creates the characteristic curve of time amount-**** (t-theta) respectively like drawing 6 (A), (B), and drawing 7 (A) and (B), and time amount-boat speed (t-nu). Usually thetam1 shown in drawing 6 is the max of

**** theta of an acceleration trial travel time, thetam2 is the max of a sudden acceleration trial travel time, and tm1 and tm2 are time amount until **** theta usually becomes max from the start in acceleration **** and sudden acceleration ****, respectively. Moreover, num1 shown in drawing 7 and num2 are boat speed when it has usually gone through time amount tm1 and tm2 from the start in acceleration **** and sudden acceleration ****.

[0014] Based on these collection data, the theta-nu characteristic curve of the above (2) is created as shown in drawing 8 (A) and (B), and the maximum and the boat speed nu at the time of **** theta are computed. Finally, based on these data, the control pattern (nu-beta diagram) of the above (3) is created. As this control pattern, two or more control patterns are created, for example like the pattern A for usual acceleration of drawing 9 (A), the pattern B for acceleration in drawing 9 (B), and the pattern C for sudden acceleration of (C).

[0015] According to the flow chart of drawing 5 , as data collection conditions judged at step 51 when [which was mentioned above] usually carrying out acceleration **** and sudden acceleration **** ** Is the flap going up (in the case of an outboard motor)? Is it an initial sailing location? ** gear Advance or ? (in go-astern, it does not carry out) ** boat speed -- 0 (km/m) -- it is -- ? and ** throttle -- a close by-pass bulb completely -- it is -- aren't there ? and a ** wave (in order to carry out by avoiding disturbance)? ** rudder angle is 0 -- do only ? (when there is rudder angle, conditions come -- it cures -- hurt) ** loading condition-navigation person [?]? **** is taken into consideration.

[0016] If all of these conditions become yes (Yes), **** which performed push and step 52 and mentioned the switch 16 above will be performed. After ending data collection at step 53 and judging the quality of the collection data at step 54, in order to obtain the high control pattern of precision, it is good to be made to perform at least two data collection like step 55. And create two or more control patterns as mentioned above, a control section 9 is made to memorize this, and it ends.

[0017] **** control at the time of this sailing is carried out like the flow chart of drawing 10 based on two or more control patterns obtained by the above learning functions, and automatic control of the tilt angle beta of a flap or the outboard motor itself is carried out. It sails by this control by a marine vessel serving as most efficient **** according to the property in which that marine vessel carries out a proper. **** control of this sailing by the flow chart of drawing 10 is performed as follows. First, the change of **** theta based on change of loading conditions is inputted by step 101. Subsequently, **** control is carried out by step 102 only when a gear is advance. Moreover, the rudder angle alpha is the predetermined constant alpha 0 by step 103,104. It does not become above but boat speed nu is control minimum rate nus. It is made to control, whenever it is large. However, boat speed nu is control minimum rate nus. Even when small, the throttle opening gamma is predetermined opening gammam by step 105. Control is performed when large.

[0018] When the terms and conditions mentioned above are satisfied, the tilt angle beta is the initial tilt-angle constant beta 0 by the loop formation 106. A large thing is checked and setting out of the tilt angle beta of the initial position (splashdown) of a flap or an outboard motor is performed. subsequently -- a step -- 107 -- depending -- a throttle -- open -- a rate -- gamma -- ' -- open -- a rate -- a constant -- gamma -- s -- ' -- receiving -- size -- relation -- and -- a step -- 108,109 -- maximum include-angle thetam of **** theta According to decision of size-related [receiving], a suitable control pattern is chosen out of two or more control patterns A, B, and C, and most efficient **** control is performed.

[0019] In addition, although two kinds such as acceleration and sudden acceleration were usually performed in the example mentioned above as **** performed by the learning function, as this ****, you may be one kind of acceleration sailing of arbitration, and from that ****, by addition or subtraction of a fixed rate, other acceleration sailing can be set up and can be made to be the same as that of the two above-mentioned kinds of cases. Naturally, three or more kinds of acceleration sailing may be made to perform a learning function.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the schematic diagram of the marine vessel equipped with the control unit by this invention.
[Drawing 2] It is II view drawing of drawing 1 .
[Drawing 3] It is the schematic diagram of the marine vessel equipped with the control unit which consists of other examples of this invention.
[Drawing 4] It is explanatory drawing explaining ****theta, the tilt angle beta, ****nu, etc.
[Drawing 5] It is a flow chart when creating a control pattern.
[Drawing 6] (A) Usually, it is the characteristic curve sheet of time amount t-**** theta by acceleration ****.
(B) It is the characteristic curve sheet of time amount t-**** theta by sudden acceleration ****.
[Drawing 7] (A) Usually, it is the characteristic curve sheet of time amount t-**** nu by acceleration ****.
(B) It is the characteristic curve sheet of time amount t-**** nu by sudden acceleration ****.
[Drawing 8] (A) Usually, it is the characteristic curve sheet of **** nu-**** theta by acceleration ****.
(B) It is the characteristic curve sheet of **** nu-**** theta ** by sudden acceleration ****.
[Drawing 9] (A), (B), and (C) -- it is drawing showing the control pattern which consists of **** nu-tilt-angle beta-rays drawing, respectively.
[Drawing 10] It is the flow chart which performs **** control at the time of this sailing.
[Description of Notations]
1 Hull 2 Outboard Motor 3 Flap
4 Oil Hydraulic Cylinder (Tilt Equipment) 5 Pump
10 Speed Sensor 11 Dip Sensor 12 Throttle Sensor
13 Rudder Angle Sensor

[Translation done.]